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INTERNATIONALIZATION IN THE INFORMATION AGE:
A New Era for Places, Firms and International Business Networks?

by Juan Alcácer, John Cantwell and Lucia Piscitello

Abstract

The new techno-economic paradigm of the information age has brought about new structures and processes in international business (IB). In this article, we examine the changing nature of the competitive advantages of places, the competitive advantages and strategies of firms, and the governance structure of IB networks in what has also been called the third industrial revolution. These three areas of change in IB activities can be mapped respectively to the location (L), ownership (O) and internalization (I) advantages of the eclectic paradigm. We interpret these OLI factors as dynamic constructs in order to depict analytically the shifts in the IB environment and their implications for IB.

Keywords: Information age, internal and external networks, connectivity, ownership advantages, eclectic paradigm.

1. Introduction

Contemporary trends in international business and in wider society are associated with the continuation and now flowering of the information age that began in the latter part of the 20th century, which has been widely characterized as a third industrial revolution (see e.g. Dosi et al, 2013). There have been three forms of capitalism or industrial ages that have followed one another in an historical sequence since the time of the first industrial revolution, and these can be termed: machinery-based and trade-based capitalism, from the late 18th to the late 19th century; science-based and managerially-coordinated capitalism, from the late 19th to the late 20th century; and information-based and internationally-networked capitalism, which has emerged since the late 20th century (Cantwell, 2014b; Freeman and Louçã, 2001). In each of these ages of distinct types of capitalism there have been two historical phases; in a first phase the lead industries of the age have emerged and grown rapidly but in a relatively isolated fashion, while in a second phase the technologies and methods that have characterized a techno-economic paradigm have found widespread applications across all industries (see von Tunzelmann, 1995; and also Perez, 2002, 2009). We are now entering this second diffusion phase in the case of the information age. In other words, we do not consider this diffusion phase of the information age to constitute a distinct 'fourth industrial revolution' (as claimed by Schwab, 2016). Schwab's (2016) arguments for why we are

now embarked on an entirely new fourth industrial age are unconvincing. He notes rightly that in the current age growth is exponential and not linear, that change pervades social and institutional structures and not just technology and production methods, and that the impact of new technologies and ways of doing business is systemic, across countries, firms and industries. Yet these same traits are true of all the techno-economic paradigms or industrial ages since the first industrial revolution, especially in their diffusion phase, and indeed these are the features that mark out these transformative eras collectively from earlier human societies[1].

In 2001 Jose de la Torre and Richard Moxon co-edited a *JIBS* special issue (32:4) that explored the impact of the dawn of the information age (and especially the spread of e-commerce) on the conduct of international business (IB). Since then, the pace of change in information and communication technologies (ICT) has accelerated. We are entering a diffusion phase in which every industry is affected by ICT. According to the Global Connectivity Index 2015 report (Huawei, 2015), worldwide ICT investments in 2015 amounted to $3,800 billion; in 2015 there were also 71,000 worldwide ICT patents, 16 million worldwide software developers, 46 million people in the worldwide IT workforce, and 1.3% worldwide ICT R&D expenditures (as a percentage of GDP). These investments which facilitate global connectivity by governments, businesses, telecom providers, and cloud service providers have a direct and tangible impact on economic growth and performance in every country. Correlation analyses show that countries with higher scores on the Global Connectivity Index (GCI) are also countries with higher GDP per capita, and that on average a 20% increase in ICT investment is associated with a 1% increase in the GDP of a country (Huawei, 2015). What has been called the information and communication age (Freeman and Louçã, 2001) has profoundly changed the character and the geographic distribution of IB activity, as illustrated by the debates over whether the world has become flat (Friedman, 2005) or remains spiky although across a wider range of locations (Florida, 2005).

Yet the changes brought by this new era go beyond location. At the level of firms or organizations, the ICT revolution has facilitated new trends in organizational decentralization (Ghoshal and Bartlett, 1998), vertical disintegration and specialization (Langlois, 2003), modularity (Baldwin and Clark, 2000), flexibility (Volberda, 1998), accelerated knowledge creation, diffusion, and complexity (Foss and Pedersen, 2004), and inter-organizational collaboration and openness (Chesbrough, 2003), among others. Institutions too have been co-evolving with the new wave of technological innovation (North, 1990), leading to changes across countries in the mechanisms responsible for standardization, intellectual property rights, regulatory and industrial policies, trade

[1] A colorful account of the traits described by Schwab, but applied to the case of the first industrial revolution was provided by Marx and Engels (1848).

policies, privatization and liberalization and the institutional conditions fostering individual and local creativity (Mowery, 2009).

The cumulative nature of these locational, organizational and institutional changes triggered our interest in revisiting some of the questions which were raised by that earlier *JIBS* special issue. In particular, this special issue presents six articles that develop a finer-grained analysis of how the locational dispersion of activities coordinated by the MNE, the competitive advantages of firms, and the governance structures of IB networks have been adapting or may further adapt to more recent technological and allied institutional changes in the business environment.

Considering first the locational spread of IB activities, Chen and Kamal (2016) find that ICT adoption is positively associated with a greater likelihood of geographically dispersed in-house production, as measured by increases in intra-firm trade shares. This is consistent with the earlier suggestions by de la Torre and Moxon (2001) and Zaheer and Manrakhan (2001) that ICT tends to widen the geographic dispersion of international business networks. However, in the more recent studies this outlook has been more carefully qualified and refined. Laplume, Petersen, and Pearce (2016) investigate how a particular new manufacturing technology enabled by ICT – 3D printing – may affect the geographic span and density of global value chains (GVCs). They claim that the wider adoption of this technology has the potential to partially reverse the trend toward fragmented, specialized, and globally dispersed supply chains. It would do so by consolidating some intermediate product manufacturing and thereby eliminating some formerly separate upstream facilities, and yet by the same token it may increase the geographic dispersion of final stage production closer to end-users or markets. So the process of GVC restructuring would have some aspects of renewed geographic concentration to offset some new drivers of dispersion.

In a similar vein to Laplume et al (2016) in this respect, Rezk, Srai, and Williamson (2016) highlight the trade-off in the impact on the geographic dispersion of production activities of computerized manufacturing technologies. On the one hand, these technologies open up new options for firms to fragment and disperse their activities, and hence move from collocating activities locally to dispersing the value chain; yet on the other hand, these technologies allow fewer production stages and a more integral product architecture, which requires production activities and tasks to be closely coupled. Accordingly, they claim that the latter tendency will transform some products that have been delivered through complex, multi-tier value chains into relatively short-tiered, integrated chains, depending, again, on product characteristics and their associated knowledge attributes.

Turning to the impact of the information age on firms, the current special issue breaks fresh ground compared to the earlier *JIBS* special issue of 2001. In the current set of papers the unit of analysis in

all the empirical work is at the firm level, unlike in the earlier special issue. Brouthers, Geisser and Rothlauf (2016) examine the determinants of competitive advantage and strategy of a special type of e-business company – the ibusiness firm – which uses the internet and other computer-based information system (CBIS) technologies to allow users to interact with each another. Since the core offerings of ibusiness firms are fully digital and are transferred over electronic networks, they are instantly accessible from anywhere in the world at relatively low costs. Therefore, the capacity of these firms to create value and to capture value depends upon their building new networks, and on becoming an insider in established user networks. This echoes the argument of Johanson and Vahlne (2009) in a more general context that the internationalization process of firms relies increasingly on their acceptance into segmented business networks, and that the process is constrained where they are seen as network outsiders.

Another important dimension of the firm level effects of the information age pertains to the changing distribution of competitive advantages across different categories of firms in GVCs, or more generally in international industries. ICTs have facilitated the emergence of new manufacturing technologies (e.g. digital manufacturing, additive manufacturing, continuous manufacturing, collective manufacturing, crowdsourcing, cloud computing and cloud manufacturing) that lead to the increasing engagement of a wider variety of actors, including SMEs, international new ventures, international entrepreneurs and global start-ups. In this respect, Laplume, Petersen, and Pearce (2016) raise the question of whether, in certain industries, the diffusion of 3D printing technologies may change the role of MNEs as the primary coordinators of GVCs. Conversely, though, Chen and Kamal (2016) suggest that ICTs may further empower established or flagship MNEs, at least in terms of the share of international trade that they can sustain through their own IB networks. This is an interesting debate which remains to be settled.

Thirdly and lastly, coming to the impact of the information age on the governance structure of IB networks in a new institutional environment, one line of argument has been apparent already in the previous literature. Both de la Torre and Moxon (2001) and Rangan and Sengul (2009) observed how market-based transactions and outsourcing are favored in the information age as higher quality information is more readily accessed through a greater diversity of potential channels, and Zaheer and Manrakhan (2001) argued that ICT tends to reduce the extent to which facilities in such networks are owned by the MNE. The implications of the transition from an era in which international transactions were increasingly internalized within MNEs, to an era in which GVCs have become increasingly more open IB network structures, are explored more thoroughly in this special issue. We have already mentioned how Brouthers, Geisser and Rothlauf (2016) emphasize how the involvement in and management of IB networks is central to the activities of ibusiness

firms. Yet Laplume, Petersen, and Pearce (2016) question whether, in certain industries, the diffusion of 3D printing technologies may change the role of MNEs as the flagship orchestrators of GVCs, by eliminating or reducing the need for geographically separate intermediate goods production and the associated MNE-coordinated international trade relationships.

Three articles in the special issue address the issue of how the fragmentation of production in the information age may influence the governance structure of IB networks. In the case of international technology alliances between software and hardware firms, Lew, Sinkovics and Yamin (2016) show how product modularity can act as a substitute for relational governance, even when cultural distance among partners is high. In other words, fragmentation and modularity may make relationships among partner firms more immune to cultural differences. Thus, heterogeneity in the characteristics of technology matter for governance, such as the extent of complexity of ICT applications, and the degree to which production processes can be codified. Chen and Kamal (2006) demonstrate that more complex forms of ICT are associated with a stronger positive responsiveness of intra-firm trade shares to ICT adoption. Yet instead, in industries in which production specifications are more easily codified in an electronic format, MNEs are less likely to engage in intra-firm trade, relative to arms-length trade, following ICT adoption. In their study of the fragmentation and offshoring of business services, Gooris and Peters (2016) contend that the fragmentation of processes across units allows firms to vary their information-protection approach according to the specific institutional context of each host country regulatory environment, and to thereby selectively develop the differentiated use of internal controls over activities performed abroad. Owing to IT-enabled integration capabilities, firms can exploit complementarities between dispersed fragments of a process while reducing the misappropriation hazard of individual fragments.

These articles not only develop much further some of the concerns raised and discussed by the 2001 *JIBS* special issue, but they also call for us to revisit our conceptual understanding of IB. In the remainder of this Introduction to this special issue we elaborate from an analytical perspective upon the three areas of change in IB activities in the information age that we have identified, and which are reflected in the articles. In the next section we consider changes in the competitive advantage of places in the information age, and in the following section we turn to the changing characteristics of the competitive advantages and strategies of firms. Then we move to the evolution in governance structures in IB networks in the current era. In terms of the corresponding areas of IB theory to which our arguments relate, these three sets of issues can be mapped directly to the OLI factors in the eclectic paradigm (Dunning, 2001). The competitive advantages of places concern their location (L) advantages from an IB viewpoint, the competitive advantages of firms are their ownership (O)

advantages in IB terms, and the governance structures of IB networks in the new institutional environment refer to the extent of internalization (I) advantages in the direct coordination of activities by firms or MNEs. Moreover, these OLI factors are best understood as evolving over time, and so their changing nature expresses the underlying shift in the IB environment over longer periods (Cantwell, 2015).

2. Location and Geography in the Information Age: the Competitive Advantages of Places

In explaining the spatial behavior of MNEs, traditional location theory has been mainly concerned with the firm's need to achieve economies of scale while simultaneously minimizing transportation costs. However, advances in transportation and communication technologies, the globalization of the world economy (Dunning, 2009), as well as the evolution of the nature, capability, and strategy of MNEs (Cantwell and Mudambi, 2005) require a new conceptualization of location behaviors. For example, recent studies and ongoing research (see e.g. Cano-Kollmann, Cantwell, Hannigan, Mudambi and Song, 2016) emphasize the role of local clusters, agglomeration, connectivity, and global cities, while exploring the unique advantages these locations may offer to firms—and vice versa—in a world that, far from becoming flatter, is increasingly uneven, spiky, and rugged. Within this context, local and global knowledge sourcing are increasingly becoming complements in the innovation strategies of successful MNEs

ICTs and agglomeration

Although Leamer and Storper (2001) argued that "[i]t is widely believed that the internet will have a more dramatic effect on economic geography than previous rounds of innovation, somehow suspending the force for agglomeration by allowing remote coordination of new and innovative activities", empirical research suggests that firms agglomerate activities and geographic clusters still exist (Ellison and Glaeser, 1997). As the internet does not allow for the kind of geographic and social proximity which is generally required for competence-creating MNE subsidiaries to build critical competences and combinative capabilities (Kogut and Zander, 1992), face-to-face interaction has not lost its key role as a complement (rather than a substitute) to cross-border connectivity.

Multinational companies have been shown to benefit from location advantages derived from agglomeration economies, as proximity reduces costs for accessing specialized inputs and human capital while enabling knowledge spillovers (e.g., Mariotti et al., 2010; Alcácer and Chung, 2007; Rosenthal and Strange, 2004). However, the propensity to agglomerate varies by activity (Alcácer, 2006). For example, Alfaro and Chen (2014) show that headquarters, on average, cluster the most.

Outside the academic literature, recent data from the MGI CompanyScope database (MGI-McKinsey, 2013), which tracks all publicly traded, privately held, and state-controlled enterprises with annual revenue exceeding $1 billion,[2] show that the head offices of major companies are extraordinarily concentrated in a small number of cities. In fact, of the 2,600 cities in MGI's Cityscope database, only 850 host the headquarters of a large company, and the top 20 cities of the world (by the number of HQs hosted) are home to 34% of all large companies and almost half (47%) of their combined revenues.

MNE foreign subsidiaries[3] are even more concentrated than their headquarters, but they are clustered in different hubs as developed regions are home to two-thirds of them.[4] The list of top cities chosen for foreign subsidiaries also diverges from the list of top cities for headquarters, particularly in emerging markets. In fact, large foreign subsidiaries seem to cluster in cities that, in addition to being well connected and good places to do business, are where senior managers would like to live. Cities with a reputation for a high quality of life (for example, Sidney, Toronto, Prague, and Singapore) have been relatively more successful in attracting the foreign operations of multinationals. However, companies from emerging markets tend to be more diverse and may have a broader set of criteria when selecting locations for future expansion, including the personal ties of executives who were educated abroad, the need to diversify family holdings, reputation-building in their home markets, and a greater willingness to enter frontier markets. By 2025, emerging regions are expected to be home to almost 230 companies in the Fortune Global 500, up from 85 in 2010 (see also The Global Power City Index 2014). The relative importance of location factors is likely to change accordingly.

The rise of new location advantages, or the decline of traditional ones, is evident when looking at the worldwide geographic dispersion of MNE activities. As locational factors are changing, new centers have arisen, especially, but not only, in emerging markets. While in 2000, 95% of the Fortune Global 500 were headquartered in developed economies, McKinsey expects that at some stage nearly half of the world's largest companies will follow growth opportunities to establish their headquarters in emerging markets, elongating the world economy in an easterly and southerly direction.[5] Those changes are already evident. For example, although 20 of the top 25 cities were in developed regions in 2013, Bejing was the highest ranking emerging-market city (6th for the total

[2] This database records some 8,000 distinct large companies worldwide.

[3] The analysis concerns 2,300 subsidiaries with $1billion or more in revenue in the MGI CompanyScope database.

[4] Western Europe is home to a very high 41% percent of the global total (3.4 times the U.S. share), as European firms have expanded across national borders to penetrate more of Europe's single market.

[5] Consider Myles Shaver's work on Minneapolis as a center for the HQs of 19 Fortune 500 firms in 17 different industries (http://www.civiccaucus.org/Interviews/2015/Shaver-Myles_09-04-15.htm).

number of global HQs and 3rd for total revenue), surpassing New York and London. A number of medium-sized cities in China are also home to vibrant company clusters and growing rapidly.

The locus of economic activity is also shifting *within* these markets. Nearly half of global GDP growth between 2010 and 2025 is anticipated to come from the so-called 'Emerging 440'— small and medium-size cities in emerging markets—which would increase their share of global revenues from 23% today to 46% in 2025 (MGI, 2012).[6] Large foreign subsidiaries are becoming more evenly distributed between developed and developing countries, but they remain concentrated in just a few key cities in each region.

These data provide the most obvious challenge to the flat-world hypothesis: the explosive growth of cities (Florida, 2004). As already foreseen by Leamer and Storper (2001), the internet age is likely to be highly urban, with global city-regions as central nodes in the world economic geography. Although the location choices of MNEs have already been shown to heavily depend on the degree of connectivity and/or openness of the host location (Nachum et al., 2008), recent empirical evidence (e.g., Goerzen et al., 2013) highlighted the role of global cities as a locational means for MNEs to overcome the liability of foreignness. Specifically, the economic and social characteristics of a global city, including its connectivity to local and global markets, alleviate the added complexity costs created by distance, uncertainty, and reduced legitimacy in foreign markets.

Additionally, the spatial division of activities by MNEs results in specific patterns of collocation in and around global cities that, in turn, influence the evolution and development of those locales (e.g. MNEs and global cities co-evolve). Goerzen et al. (2013) find that while demand-driven, market-seeking and market-serving activities, such as sales and distribution, are more likely to locate in global cities, supply-driven, efficiency-seeking and asset-seeking activities, such as production and R&D are more likely to be located outside global cities. That fosters the co-evolution of MNE location strategies and the emergence of certain locales as centers of particular types of economic activities—a new and more complex variant on Hymer's (1972) argument on the relationship between MNE and locational hierarchies.

However, MNE location choices are not driven by external agglomeration alone; another motivating force is intra-firm agglomeration, i.e., the opportunity to internally agglomerate a firm's functional activities and thereby increase information while reducing uncertainty and transaction costs (Alcácer and Delgado, 2016). This issue is not entirely new, as it is rooted in the path-breaking intuition by Ohlin (1933), who proposed a distinction between agglomeration economies that are internal, as opposed to external, to the company. Indeed, as MNEs are by definition multi-

[6] One example is Tianjin, a city 120 kilometers southeast of Beijing. In 2010, McKinsey estimated Tianjin's GDP at around $130 billion, about the same as Stockholm's. By 2025, its GDP is expected to rise to around $625 billion, approximately that of the whole of Sweden.

unit and multi-location entities, their competitive advantage relies crucially on the appropriate distribution, coordination, and control of geographically dispersed activities (Howells and Bessant, 2012). The advent of new ICT technologies, and their impact upon the fragmentation of production and global sourcing strategies, together with new tools for integration and coordination (e.g., Fort, 2014), has encouraged MNEs to pursue internal as well as external agglomeration. Both sequential (i.e., when one function is dependent on another for information, materials, or technology) and reciprocal (i.e., mutually co-dependent) functional interdependencies can be largely managed by collocation. Hence, MNE location choices become increasingly less dependent on traditional location factors and increasingly more dependent on their past choices, even if these choices were suboptimal (Mariotti et al., 2015). As Coase (1937: 397) anticipated "the cost of organizing and the losses through mistakes will increase with an increase in the spatial distribution [spread] of transactions organized."

Local clustering, global connectivity, and knowledge creation

In a world that is becoming increasingly connected through organizations, people, technology, and social media, successful MNEs leverage the interconnections between local and global networks (Bathelt et al., 2004; Hernandez, Vasudeva, and Zaheer, 2015). There has been a growing awareness among scholars that MNEs use their multinational networks to augment their competitive advantages and/or create new advantages. The observed decentralization in the management of international R&D, and the increased role of geographically dispersed sourcing of technology through the international networks of globally integrated MNEs has led to greater focus on the asset-acquiring motive for foreign direct investment (Cantwell, 1989; Dunning and Narula, 1995; Kogut and Chang, 1991), as well as in the capture of 'home-base augmenting' benefits (Kuemmerle, 1999; Papanastassiou and Pearce, 1997). Thus, MNE technological activities cumulatively interact both with the local networks in each location and with the cross-border knowledge exchange in international, in-house networks (Nohria and Ghoshal, 1994; Piscitello, 2011).

The access to localized knowledge has been also found to be a crucial factor in explaining the capacity of MNEs for locally exploratory activity (Andersson and Forsgren, 2000; Andersson et al., 2002; Cantwell and Mudambi, 2005; Forsgren et al., 2005; McEvily and Zaheer, 1999). Indeed, most of the literature on competence-creating (CC) activities by MNE subunits has stressed the purely local features of being embedded in the business networks and the national or regional innovation systems (Iammarino and McCann, 2010) of a host country, and how embededdness increases reliance on distinctively local knowledge sources (Almeida, 1996; Frost, 2001). Recent

studies have shown that international knowledge connections also play a role in an MNE subunit's innovative activity (Cantwell and Piscitello, 2014). Especially when subsidiaries evolve towards a CC role, and draw more on locally clustered knowledge, they will simultaneously rely on their stronger connectivity to global knowledge (Cantwell and Mudambi, 2011). The rising relative significance of local and regional knowledge sourcing might be viewed as paradoxical in the digital age, with the seeming ease of transmitting knowledge and of long-distance collaborations, as well as the expanding intra- and inter-firm long-distance networks or pipelines for collaborating and exchanging knowledge. However, this is not an "either/or" phenomenon: Local and distant knowledge sourcing are rising together, and they are interrelated.

The interconnectedness of the nodes of companies and, ultimately, of their location choices mirrors the increasing complexity of knowledge. Thus, the intra-firm adoption of ICTs has contributed to maintaining connectivity and relatedness between different fields of knowledge where there is geographical dispersion. In fact, ICTs may reduce the need for collocation, thus allowing companies more degrees of freedom in their location decisions. However, at the same, the interconnectedness and international openness of locations can give rise to wider and often unexpected patterns of knowledge recombination for MNE subunits (which in turn blend knowledge taken from the local context and the parent company), which can lead to new areas of knowledge and competence creation (Cantwell and Piscitello, 2014). Depending on the specific project or task, MNEs may adopt a variety of combinations of competencies that rely on geographically dispersed actors. Thus, the activated connections change dynamically over time,[7] which might lead also to changes in the patterns of technological relatedness across activities and locations. On the one hand, ICTs help companies to orchestrate activities across several networks, and to coordinate over geographical and technological space; on the other, they allow companies to re-design the boundaries of those networks.

3. The Competitive Advantages and Strategies of Firms

The nature of the relationship between MNEs and innovation has always been at the heart of the theory of the MNE, since Hymer and Vernon, as well as Teece (1977) - see Cantwell (2014a) and Teece (2014). ICTs affect differentially the competitive advantages of firms, and create new ones. In the traditional conceptualization of MNEs, firms developed their ownership advantages (the sources of competitive advantage) first at home through innovation, branding or a particular proprietary and hard-to-imitate business model. After calibrating their competitive advantage to a

[7] In neuroscience, this is called *effective connectivity*, and it changes according to the given context of task performed (Lang et al., 2012; Friston, 2011).

new market, firms created value globally by applying the same competitive advantages in new markets (Hymer, 1972; Morck and Yeung, 1991), or in new natural resource extraction sites.

This approach, centered around the MNE as the focal actor and, to a lesser extent, its subsidiaries across countries, as the primary units of analysis has been challenged by two trends. First, a more globalized environment for innovation became a powerful source of sustainable competitive advantage. Innovation as the fuel for competitiveness relies on the ability of firms to recombine existing knowledge as well as to develop new knowledge. So the study of IB moved, conceptually and empirically, from a centralized perspective in which firms used knowledge mostly originated in headquarters to innovate products and services, to a decentralized approach in which firms tap into geographically dispersed innovation systems and knowledge flows across organizations in dense networks. Second, as technology has become more complex capabilities became more modularized or focused, leading firms to specialize in particular parts of a value chain. As a result, value chains became fragmented across locations as many new specialized players originated from different countries.

These two trends have forced IB researchers to recognize that firms need to develop new ownership advantages that emphasize increasingly their capacity to integrate information and knowledge across geographies and across internal and external organizational boundaries. Thus, Dunning and Lundan (2008) redefined the MNE as the orchestrator of international networks, akin to the earlier notion of Nohria and Ghoshal (1997). Because of this increasingly globally dispersed process of value creation based on specialized but interconnected branches of knowledge, the MNE became an institution for making linkages between knowledge sources that might otherwise appear to be unrelated. Moreover, a dispersion of innovation implies a spreading of the positions of authority or control in a network as international MNE networks for innovation have evolved towards an enhanced differentiation of subsidiary capabilities. Parent-subsidiary knowledge relationships have become stronger, with Cantwell and Piscitello (2014) highlighting that 'dual embeddedness' in both internal and external networks is more pronounced with locally competence-creating MNE subunit activities. This is because the locally specialized knowledge of an MNE subsidiary must be effectively combined with the core business knowledge of the parent company in the home country in order to develop new lines of application, sometimes in a new industry or in a new industry segment.

Although IB scholars have begun to unpack how multinational firms *create value* in a more decentralized, modular and geographically dispersed environment, less research has been conducted on how these firms *capture value*. Traditional methods to protect intangibles, from trade secrets to traditional intellectual property (IP) tools such as patents and trademarks, are still useful but not

sufficient when the knowledge behind the source of a multinational's competitive advantage resides in different organizations spread across locations (Alcácer, Beukel and Cassiman, 2016). The use of alternative mechanisms to protect intangibles and capture value from them, an important dimension of the O advantage in the traditional OLI framework, thus becomes an area in need of further research as the effectiveness of using firm boundaries to capture value decreases. The arguments of Gooris and Peeters (2016) on knowledge protection across different institutional environments including different IP regimes can be related to some similar themes in the strategy literature. Liebskind (1996) argued that firms can isolate various components of the same product so that any one project team cannot reproduce the entire product without help from other teams, thus minimizing the damage from knowledge outflows. In studies of multinational R&D strategies, Zhao (2006) and Zhao and Islam (2016) found that firms with strong internal linkages are able to conduct R&D in environments with weak IP protection by substituting their internal organization for external institutions. Alcácer and Zhao (2012) also found that a combination of fragmented knowledge and strong external linkages allow competing firms in the semiconductor industry to locate close to rivals while enjoying the benefits of agglomeration economies, including local knowledge spillovers, in a geographic cluster.

The coexistence of cooperation – a necessary condition for creating value - and competition – an incentive to innovate, but a threat to the capacity to capture value, has also been at the heart of the international alliance literature. For example, Mowery, Oxley and Silverman (1996, 1998) examined the relationship of corporate governance structures to knowledge flows between partners in alliances; partners that simultaneously face incentives to cooperate to create new knowledge and incentives, yet also to behave opportunistically to capture a higher share of the rents from innovations. Oxley and Sampson (2004) explored further the opposing forces of cooperation and competition in international alliances, while Sampson (2004) quantified the potential cost of a misalignment of the governance mode and the goals of an alliance. Although focused mostly on exploring horizontal linkages between a few partner firms, these studies suggested high levels of theoretical complexity and nuance behind the need to balance value creation and value capture in settings in which knowledge and the sources of competutive advantage reside beyond the boundaries of a given firm.

Although anecdotal evidence increasingly suggests that innovation, knowledge and competitive advantage is created by tightly linked or networked firms that combine to form a GVC, as yet relatively few studies have focused on value creation and value capture across vertically-linked firms. Dyer and Nobeoka (2000), Pack and Saggi (2001) and Takeishi (2001) have emphasized the value creation aspects of vertical relationships by highlighting the mutual benefits of active supplier

involvement in innovation activities. Alcácer and Oxley (2013) bring both value creation and value capture together in their analysis of supplier-buyer relationships in the wireless handset industry. Their findings, parallel to those in the case of international alliances, have highlighted the need to consider both the *means* and the *motives* for knowledge sharing in original equipment manufacture relationships.

The message from these various literature streams when taken together points to the need to rethink for the current environment the nature of O advantage that multinationals may enjoy as technology allows for a more organizationally and geographically dispersed system of operations, in which knowledge, innovation and competitive advantage do not reside solely in any one single part of a business ecosystem, but rather in its structure and its various linkages. The challenges to exploring the issues of value creation and value capture in this context are considerable, and yet so too are the potential benefits of doing so.

4. The Governance Structures of IB Networks: the Increasing Significance of the Separation of Ownership and Control

The distinction between corporate ownership and control became important in the second major techno-socio-economic paradigm (Freeman and Louçã, 2001), the science-based, oil-intensive mass production era that emerged in the late 19th century. This second industrial age saw the driver of new technological transformations shift from the proprietary or family firm to the managerial or modern corporation (Lazonick, 1992). The large firms of this age relied on the internal organization of managerial hierarchies (Chandler, 1962, Williamson, 1975), and the development of the associated multidivisional organizational form was led by large US firms. The separation between ownership and control in the managerial corporation in the science-based and oil-propelled mass production age and its implications were famously discussed by Berle and Means (1932), and eventually helped to give rise to the formalization of principal-agent models (Jensen and Meckling, 1976), when applied to shareholder-owners as principals and corporate managers as their agents.

We contend that the separation between corporate ownership and control matters even more now in the third industrial age, the information age, than it did in the science-based mass production era. In the second scale-based paradigm a rough analogy or parallel could still be drawn between ownership and control in IB contexts. In essence, MNE parents both owned and controlled their foreign-located subsidiaries, control being exercised through an internal managerial hierarchy, such that this centralized hierarchical control by the headquarters over parent-subsidiary transactions could be readily construed as the internalization of (potential) market coordination of the exchange arrangements between the two. The coincidence of ownership and control is also built into the very

definition of foreign direct investment (FDI), in which it is assumed that once ownership passes some threshold it confers control over the invested entity, and it is further implicitly supposed that in the absence of ownership there is in general no control. However, this approximate association between IB ownership and control of activities across borders, while never entirely accurate, has broken down completely in the contemporary era of IT-based and network-orchestrated GVCs. Flagship MNEs frequently now control or orchestrate a far wider spectrum of IB activities than those in the facilities that they own.

The main implication of the widening gulf between ownership and control for IB theory is that it is less appropriate now than it once might have been to conflate the concept of firm-specific advantages (FSAs, which are held internally within firms) with the concept of ownership advantages, which is a potentially misleading analogy that has unfortunately become quite commonplace in the IB literature. Although FSAs are a substantial subset of the full range of O advantages used by firms, the notion of O advantages is a broader one. O advantages refer not just to the capabilities that firms hold themselves directly, but also to the capabilities they can access externally through the networks of various kinds in which they participate. Thus, O advantages combine firm-specific in-house capabilities with network-specific access to external (non-firm-specific) capabilities or resources. The network-specific access to external capabilities or resources is of two kinds. First, as reflected in the full original terminology of the 'advantages due to the nationality of ownership', the parent company of an MNE enjoys access to various resources by virtue of its origin in its home country. These advantages reflect the relative strengths of the institutions of the home country rather than capabilities internal to the firm itself.[8]

Second, as suggested already, MNEs become part of a variety of more open IB networks that entail elements of reciprocity, in which the MNE makes certain of its capabilities available to others and in return it is able to draw upon external capabilities in other organizations. This latter type of relational network advantage entails not just membership in or identification with a network, but it is influenced by a firm's position and history within a network. A firm's access to this kind of capability through its networks depends on the extent to which it is an insider in each network, sometimes expressed as the extent to which it is embedded (see Cantwell and Mudambi, 2011). So in any given network the accessibility of external capabilities is a matter of degree rather than a matter of kind, depending upon the degree of insidership that characterizes a firm's position within each business network in which it is engaged. Whatever combination of its own capabilities, home

[8] Of course, all the O, L and I factors are symmetrical in the sense that they may be either advantages (positive) or disadvantages (negative), and so it is possible that an association with a home country origin may sometimes be a disadvantage rather than an advantage - an argument made more commonly now that emerging market MNEs have become increasingly active.

country derived capabilities and resources, and IB external network capabilities the firm relies upon, the core O advantage of the firm from an evolutionary perspective is its ability to use these capabilities selectively and where appropriate in combination in order to innovate, and to create new value.

I advantages can be related to the span of IB networks orchestrated or controlled by the firm, and not just to the range of activities carried out in facilities that the firm owns (as in the traditional or legal interpretation of the boundaries of the firm). In each case the greater (less) are I advantages, the wider (narrower) is the span of operations coordinated by the firm. In the conventional approach the firm is treated as the legal entity defined by the ownership of assets, and so I advantages refer to the placement of the boundary between internal as opposed to external networks, often referred to as the 'make or buy decision'. The traditional story is one of a choice or a substitution effect between alternative modes of governance. Instead, in the information age the internal and external business networks coordinated by a firm have become increasingly interconnected (see Cantwell, 2013). Hence, when I advantages are greater with respect to the expanse of internal facilities or sub-units that are owned by the firm, then I advantages tend to be greater too with respect to the overall expanse of the internal and external IB networks orchestrated by the firm. In other words, the boundaries of the firm defined by its span of ownership, or by its span of control and orchestration, tend to move out together or to retreat together, at least in the aggregate, especially in innovative and entrepreneurial endeavors.

The rise in international knowledge connectivity in the information age, both within and between organizational units, has enhanced the potential for both cooperation and competition between facilities engaged in different activities or located in different sites. I advantages provide an indicator of the relative significance of cooperation compared to competition between distinct producer units, but they may also reflect situations in which the motives for cooperation and competition are both strong, and so active administrative coordination is needed to ensure that a suitable balance is maintained between the two. As MNE governance structures have become more open and decentralized, so internal as well as external networks are increasingly subject to the pressures of competition as well as the benefits of cooperation, as witnessed in the case of internal networks by inter-subsidiary competition for mandates or for positions of authority within a corporate group (Mudambi and Navarra, 2004). Whether it is to constrain opportunistic behavior (or address issues of bounded reliability, as discussed by Verbeke and Greidanus, 2009), or to facilitate the take up of entrepreneurial opportunities, I advantages arise where the capacity for learning in a network is increased through administrative coordination by a flagship firm or a leading sub-unit.

5. Concluding Remarks

In the information age there is a greater parallel that can be drawn between the networks in which firms are embedded (which facilitate their O advantages) and the networks in which territorial areas are engaged (which enhance their L advantages). Both firms and locations have come to need increased openness and connectivity to enhance their own internal dynamism through a wider array of partnerships and access to a more diverse knowledge base. As knowledge has become increasingly globally dispersed and yet connected, firms need to be able to construct new combinations of knowledge, the progress or success of which may depend at least initially on their capacity to build new forms of relatedness between formerly disparate branches of knowledge by connecting these across space. In turn, this connectivity may depend on firms increasing their degree of insidership in networks in a new domain in which they were previously little embedded. This may become a cumulative process, in that the pioneering of new knowledge connections by firms may begin to make them more attractive partners, and hence accelerate their transition to insider status in the new field of activity. Equally, as discussed earlier, territorial areas require greater linkages with complementary knowledge sources in other places, which linkages may include various elements and a variety of actors, but which include participation in IB networks.

These network-based associations between O advantages and L advantages can be contrasted with the alternative view usually associated with the different distinction between FSAs and CSAs (country-specific advantages), an approach proposed by Rugman and Verbeke (1992). In the standard interpretation of the FSA-CSA framework, FSAs are considered as available only to the firm by which they are held internally, and at the opposite extreme CSAs are freely available to any firm or agent located in a host country, but inaccessible outside that vicinity (see Hennart, 2009, for one statement of this juxtaposition between FSAs and CSAs). Instead, once we allow for the centrality of the role of business networks in the explanation of both O advantages and L advantages, both kinds of advantages rely on the positioning of firms and locations in networked connections, which regulate their ability to make use of external capabilities. While certain basic kinds of L advantages may be available to any firms located in a host site, for firms to be able to access more complex, socially embedded (and typically more valuable) types of L advantages requires some degree of insidership in the relevant business networks. Some of these networks may be strictly geographically local, as in the classical accounts of the benefits to local innovativeness of embeddedness in a geographic area, but others such as export business networks may reach beyond the location itself, especially to the extent that the relevant industry in the location itself is internationally open and connected (Cantwell and Piscitello, 2015). These benefits of insidership in relevant networks, and conversely the liability of outsidership have also been stressed in the

restatement of the Uppsala internationalization process model by Johanson and Vahlne (2009), although they have tended to see insidership as simply being well established in a network, while the structural position that a firm holds in a network may also matter (e.g. whether it has a central or brokerage role).

Meanwhile, as we have been arguing, I advantages can also incorporate the increased significance of networked business relationships in the information age, especially if we allow for the boundaries of control or administrative coordination by the firm, and not merely the boundaries of its ownership of assets as a legal entity. Using the more traditional narrower lens of firm boundaries by ownership, and the associated sharp distinction between the firm and the market (in which pure market coordination applies to any transaction outside the firm and those that it employs), Rangan and Sengul (2009) have shown how the growth of ICT tends to facilitate de-internalization, since ICT reduces the transaction costs of using market-based mechanisms. However, where there are GVCs or global production networks these market connections continue to be orchestrated and monitored by a flagship firm in a GVC network. In this case the role of the firm shifts from being a global organizer of geographically dispersed productive facilities that it owns, to becoming an integrator of streams of new knowledge creation across key nodes in a system of connected internal and external networks. A critical implication of this alternative perspective on I advantages is that rather than seeing an increasing externalization of business relationships as a simple reversal of internalization (I disadvantages in place of advantages), a kind of symmetrical switch in direction along a linear scale, we have argued instead that internal and external networks become increasingly complementary and hence coordinated to a greater extent in common, in the systems that are characteristic of the information age.

In the information age, O advantages incorporate as a central element capabilities to discover and integrate new combinations of knowledge taken from across diverse sources to create new value, and the primary O advantage of the MNE becomes its ability to innovate by developing new domains of application through such novel combinations; L advantages now focus more on the capacity of a location for interconnectedness with complementary locations elsewhere in the world (which capacity depends upon, but is not confined to location-bound systems), and so firm-location developmental interactions must be taken into account more fully (Cantwell, 2009; 2015; Piscitello, 2011); while I advantages can be adapted to incorporate the efficient overall coordination of GVCs which combine aspects of markets and hierarchies in the more flexible project-based networks which are now orchestrated by flagship MNEs, and so allow for the spread of more open and informal but coherent interorganizational relationships and networks.

As we had noted earlier, the O advantages associated with the capacity to capture value (rather just than creating it, although the two tend to be be connected, as a knowledge creating node is generally also a powerful and well connected one) suggest an increasing need for absorptive capacity in MNEs in order to capture benefits that might otherwise be dissipated and even lost over a wider network of interests. The span of coordination and control of many MNEs (their I advantages, in our new broader sense) now run increasingly beyond the internal facilities that they own. So in other words not all market-based transactions are alike, or conform to the conventional view of market exchange as an arms' length transaction between independent parties, and so internationally networked forms such as GVCs need to be recognized as central to the contemporary structures of global governance. While on one side of the coin (in places) the L advantages of individual places become increasingly interconnected with one another, on the other side of the coin (in firms) the nexus of international network control or orchestration of MNEs may become geographically more dispersed, and yet their ownership of assets becomes more concentrated in certain activities and places, with an eye on how they can best achieve both new value creation and value capture together.

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